Aug. 22, 1939. E. L. ACKERMAN 2,170,440

SASH OPERATING MECHANISM

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FIG. 1.

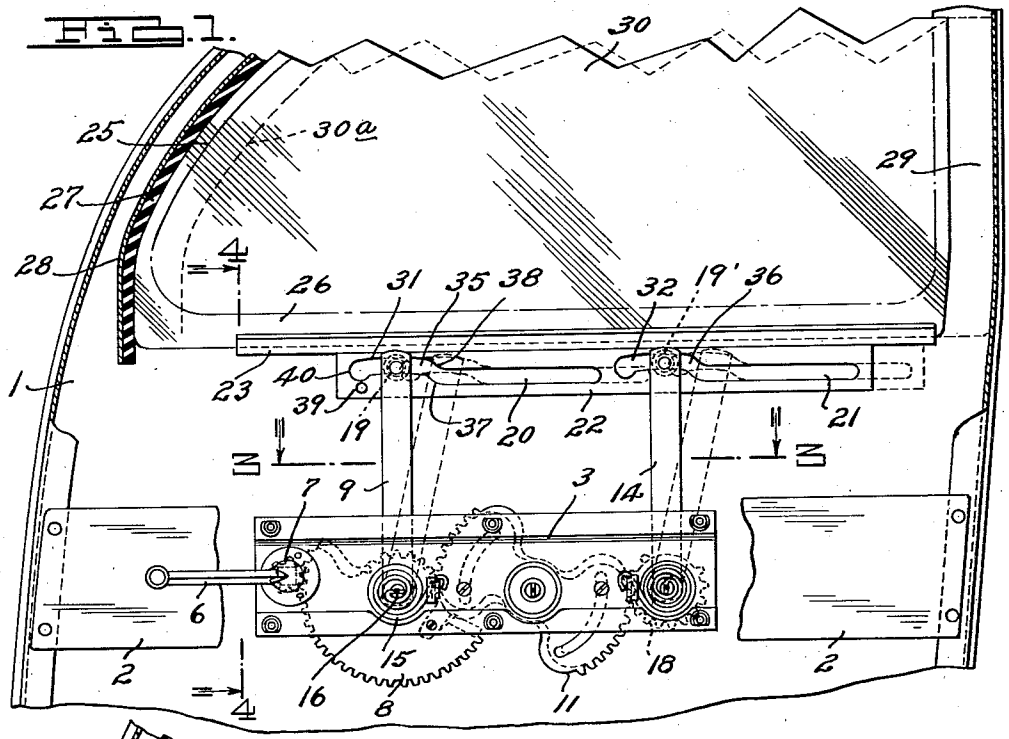
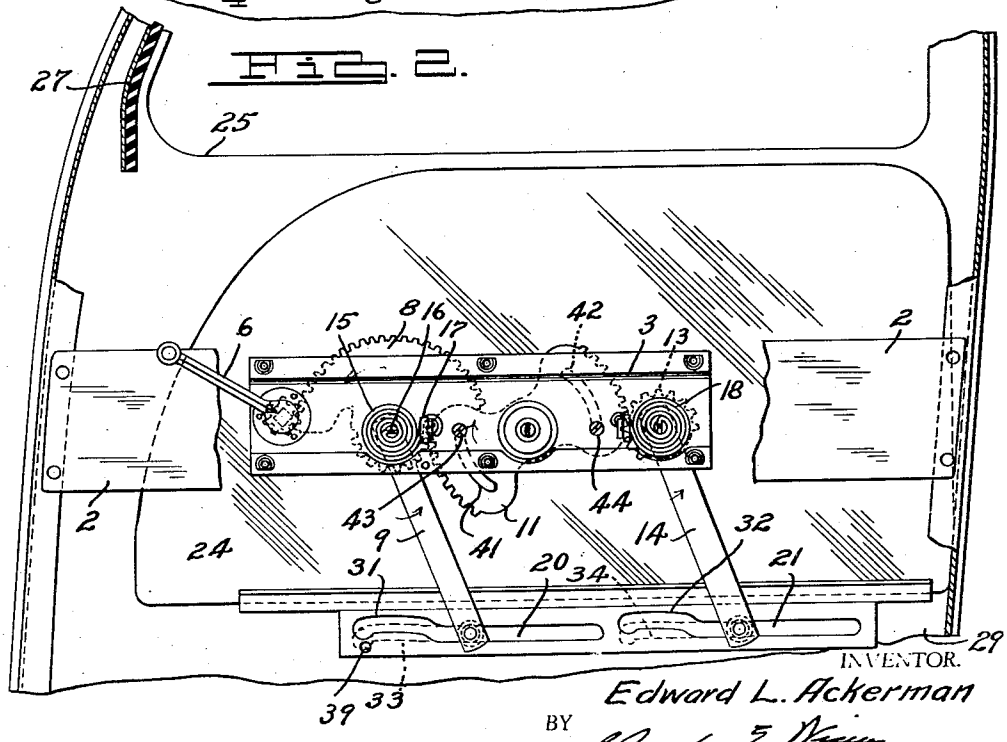


FIG. 2.



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Fig. 3.

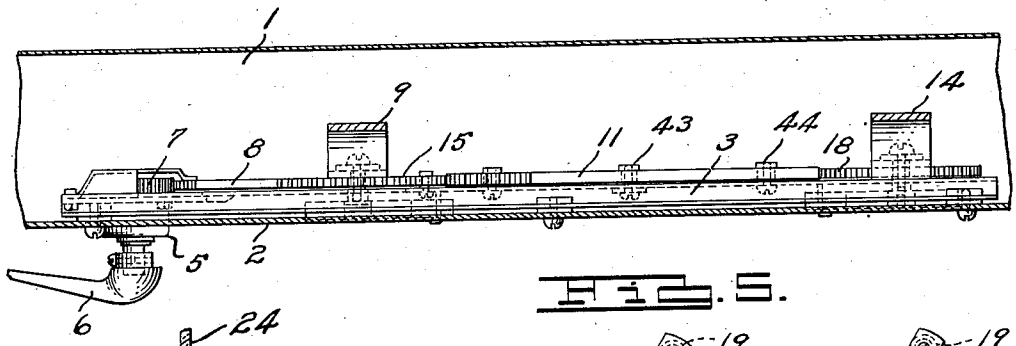
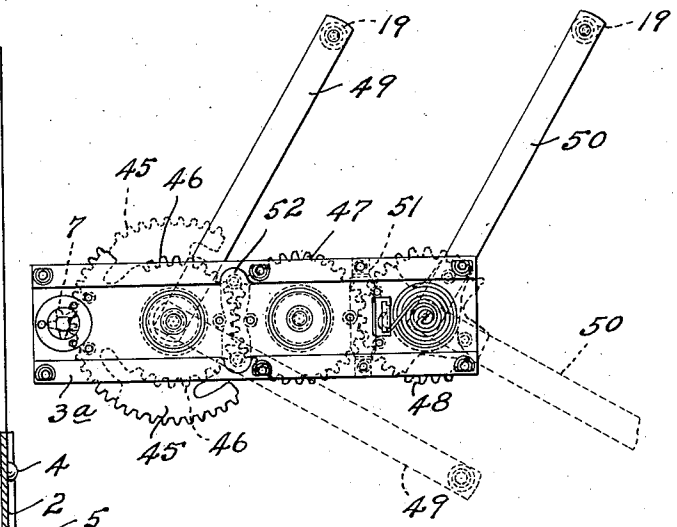


Fig. 5.



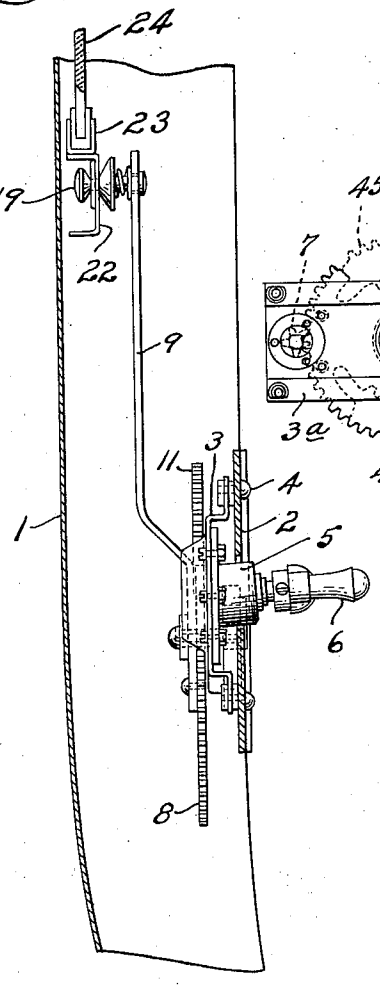


Fig. 4.

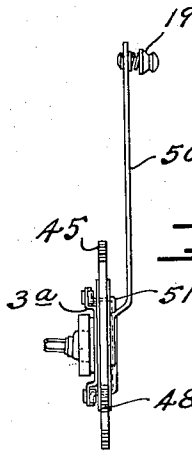


Fig. 6.

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2,170,440

SASH OPERATING MECHANISM

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Application June 24, 1937, Serial No. 150,139

4 Claims. (Cl. 268—126)

This invention relates to sash operating mechanism for automobile bodies and the object of the invention is to provide a new and unique form of double arm operator of such construction and relationship of parts that the two arms in raising or lowering the sash are moved in unison in the same direction and in parallel relationship.

It is further an object and feature of the invention to provide a sash operating mechanism having the two-arm arrangement of the character above stated including a sash supporting bracket so formed as to permit movement of rollers at the free ends of the arms therein in raising the sash or glass vertically and then move the same forward horizontally to a position providing an opening between the front edge of the glass and frame of the opening to provide for ventilation or when further moved to close the space between the glass and its forward frame edge, the reverse action taking place when the sash is lowered—that is, in the act of lowering the sash it is first moved horizontally away from the forward edge of the opening a predetermined distance and thereafter moved vertically downward.

By the arrangement of the parts, as will be understood from the description hereinafter given, a heavy and comparatively long sash may be readily raised or lowered without tilting or binding in the runways provided therefor and the gearing arrangement is such that it may be made in a right and left form for opposite front window of an automobile for instance, and the device may be conveniently formed to position the operating handle at one end or the other of the unit or approximately centrally of the operating unit thus enabling the operating handle to be conveniently positioned in respect to the operator's seat.

It is further an object and feature of the invention to provide a double arm sash operating mechanism of simple construction by which both a vertical and horizontal movement of the sash may be effected by continued rotation of the operating handle to thus provide for ventilation at the forward edge of the glass and avoids the necessity of forming the glass pane in two separately operable sections as has sometimes heretofore been the practice thus securing in a single sash operating unit an inexpensive structure whereby a single sash or window glass may be moved to either a fully closed position in respect to an opening in an automobile body or to a position where the glass is retracted from the forward edge of the frame.

These and other objects and the various novel features of the invention are hereinafter more fully described and claimed, and the preferred form of construction of a sash operating mechanism embodying my invention is shown in the accompanying drawings in which—

Fig. 1 is a vertical section of part of the forward portion of an automobile body showing my improved sash operating mechanism in position when the glass is raised to close the opening therein.

Fig. 2 is a similar view showing the position of the parts of my improved operating mechanism in the position when the glass has been practically fully withdrawn from the opening.

Fig. 3 is a sectional view of the sash operating mechanism taken on line 3—3 of Fig. 1.

Fig. 4 is a section showing the sash operating mechanism and body structure taken on line 4—4 of Fig. 1.

Fig. 5 is an elevation of an alternative form and arrangement of the gearing.

Fig. 6 is an end view thereof taken from the right side of Fig. 5.

No attempt has been made to show a complete automobile body but only such part thereof as may be necessary for the understanding of the operation of my improved device. Such body portion is shown at 1 in Fig. 1 and is a view taken from the inside of the body with the interior finish material removed to expose to view the sash operating mechanism which is mounted on a lock board 2 here broken away to show the sash operating mechanism. This mechanism is mounted as a unit on a recessed plate 3 having its inturned edges bolted to the lock board as by bolts shown in Fig. 4.

As is common with sash operating mechanism, a clutch mechanism is carried in a housing 5 and is operable by a handle 6. This clutch may be of any approved type as, for instance, such as is shown in the U. S. patent to myself No. 1,874,215 of August 30, 1932. The housing 5 projects inwardly of the body through an aperture provided in the lock board 2 and the clutch mechanism includes a gear 7 which meshes with a segmental gear 8 to the shaft of which the arm 9 is secured at one end. The gear segment 8 is preferably formed of a sheet metal plate and on the opposite side of the axis is formed to provide a segmental gear 10 of smaller diameter which meshes with an intermediate gear segment 11 pivotally supported on the recessed plate 3 which also has a gear segment 12 integral with the gear segment 11 opposite the pivot point. The gear segment 12 meshes with a gear 13 to which the arm 14 is

secured at one end to turn on the axis of the gear. The arms 9 and 14, as will be understood from the several figures of the drawings, lie in a parallel relation and also move by rotation of the handle 6 in unison and in the same direction. In the usual two arm window regulators the arms turn in opposite directions in raising or lowering the sash. There is a flat spiral spring 15 for the arm 9 which has its inner end attached to the shaft 16 at the axis of the gear 8 and its outer end is hooked over a lug 17 which is carried by the plate 3. The arm 14 is provided with a similar spring 18 but this spring is coiled in the opposite direction from that of the spring 15 and thus these springs are opposed in tension for a purpose hereinafter described.

The sash operating arms 9 and 14 are each provided with the usual roller 19 and 19' shown in elevation in Fig. 6 and these ride in similar horizontal slots 20 and 21 in the plate 22 attached to or forming part of the sash holding element 23 which, as is usual, is grooved to receive the bottom edge of the glass 24 as is shown more clearly in Fig. 4. The opening in the body 1 is indicated at 25 and is shown as being curved at its forward edge and approximately vertical at its rear or right hand edge shown in Figs. 1 and 2, the opening being defined by a trim element 26 positioned at the outer face of the opening in the vehicle body. Adjacent the forward edge of the opening and lying substantially in parallel relation therewith is a strip of felt or other yieldable material 27 against which the forward edge of the glass may engage when in the fully closed position and this strip may be supported in position as, for instance, by a metal strip 28. This felt strip 27 is spaced forwardly of the inner edge 25 of the body opening and forms the bottom of a sash receiving groove and at the rear edge of the opening is provided with a vertical runway 29. It is to be noted that the distance from the rear edge of the rear runway 29 to the packing strip 27 is greater than the horizontal length of the glass element 30 as shown by the dotted lines 30^a in Fig. 1 and thus when the rear edge of the glass engages the bottom of the vertical way 29, the forward edge 30^a is spaced from the formed edge of the opening 25 and this space, when the glass is in the dotted line position of Fig. 1, provides for ventilation. While what I have termed the "vertical" runway 29 is not exactly vertical, it is an uninterrupted way in which the rear edge of the glass seats during the entire raising and lowering movement.

When the forward edge is moved into engagement with the strip 27 the rear edge of the glass is moved away from the bottom of the runway 29 but does not move entirely out of the vertical runway 29 in the fully closed position. The slots 20 and 21 in the plate 22 for the respective arms 9 and 10 are shown as having an arcuate offset portion 31 at the forward end of the slot 20 and a like offset portion 32 for the slot 21 the purpose of which is hereinafter described. It is obvious, however, that if these slots were straight as indicated by the dotted lines 33 and 34 in Fig. 2, the glass would be raised or lowered by rotation of the handle element 6 in one direction or the other and whether the slots 21 and 21 be straight or have an offset forward end, the spring 18 is wound in a direction to cause the roller 19' to bear downwardly in the slot 21 while the spring 15 for the arm 19 tends to raise the sash, or in other words, tends to counter-balance the same. Under this condition, with the roller 19' bearing downwardly and the roller 19 of the arm 9 tending to raise the sash, the rear vertical edge of the glass is held against the bottom of the runway 29 and the glass therefore held from tilting.

It is desirable, however, to provide a sash operating mechanism that will not only raise or lower the sash or glass to a closed or open position, but through rotation of the handle, to not only raise the sash to closed position but to raise it to position short of being closed at the forward end although fully closed at the top and bottom.

For this purpose, I have provided the curved offset portions 31 and 32 which are connected with the slots 20 and 21 by angularly disposed connecting slot portions 35 and 36. These angularly disposed slot portions provide a lower shoulder 37 and an upper shoulder 38 in each of the slots 20 and 21 between the straight and offset portions thereof. In raising the sash or glass from the position shown in Fig. 2, the rollers first move toward the right hand end of the slots 20 and 21 and as the arms pass through the center horizontal position are then moved in a left hand direction. As the rollers reach the angularly disposed slot portions 35 and 36, the glass is in its uppermost position and the rollers pass into the curved offsets, the radius of which is the same as the radius of the roller surface. Thus while the lower edge of the offset portion of the slots is somewhat higher than the lower edge of the straight portion, the glass is not moved materially downward or sufficient to lower the upper edge of the glass out of the groove therefor. As these arms continue to be moved after they enter the offset portions, the arm 9 will engage the pin 39 secured in the bracket 22 adjacent the end of the offset portion 31, and thus moves the glass horizontally to seat at its forward end against the packing 27 but without withdrawing the rear edge out of the runway 29. The pin 39 prevents the roller 19 from entering the enlarged end 40 of the offset portion 31 of the slot 20 and a similar end is provided for the offset slot portion 32 to permit assembly of the rollers 19 and 19' on the respective arms and then introduced through the enlarged end into the slots. The rollers are then moved to the right and the pin 37 thereafter secured in the bracket. As the rollers are grooved, they are held from displacement laterally of the respective slots in the operation of the device.

The pin also provides a stop for the arm 9 and causes the glass to be moved to the left with the front edge of the glass in engagement with the packing 27 as the arm 9 engages the pin 39 after the glass has been raised to closed position at the top edge.

If now ventilation be desired, it may be secured by rotation of the handle to turn the arms 9 and 14 to the right of the position shown in Fig. 1 until the roller engages the shoulder 38 of the slot 20 and corresponding shoulder of the slot 29. This will first cause the glass to be moved to the dotted line position indicated at the forward end by 30^a and with the rear edge of the glass in engagement with the bottom of the vertical runway 29. By further rotation of the arms, the rollers are moved into the horizontal position of the slots 20 and 21 and cause the glass to be moved downwardly to any desired degree, the glass being held in any desired position by the clutch device in the casing 5 and connected with the shaft operated by the handle element 6. The bottom of the vertical runway 29 has an upper vertical portion and a lower inclined portion in the construction

here shown and as the glass is brought from its upper position to its lower position as shown in the respective Figs. 1 and 2, the glass is again moved to the left due to contact of the rear edge thereof with the bottom of the runway **29** and in raising the glass and due to the downward pressure exerted by the spring **18**, the glass is held with its rear edge engaging the runway until the glass has been fully raised and thereafter is moved to the left to close the opening between the forward end **30a** of the glass and forward edge of the window opening.

The window regulating mechanism, shown in Figs. 1 and 2, may be made right or left hand as will be readily understood for use with the right or left hand windows of a vehicle as may be readily understood and in the event the handle position is desired to be rearwardly of the structure shown in Fig. 1, the gear element **8** and its companion portion **10** may be used on the shaft of the arm **14** and the handle correspondingly placed at the opposite end of the regular unit carried by the plate **7**.

In the structure of Figs. 1 and 2, I have shown the intermediate gear portions **11** and **12** as being mounted on the outer face of the plate **3** and having an arcuate slot **41** adjacent the gear part **11** and a similar slot **42** adjacent the gear part **12** and the plate **3** may have studs **43** and **44** which extend through the respective slots and each having an enlarged head forming a support for the sheet metal plate providing the gears **11** and **12**. These studs hold the gear ends in alignment and proper meshing relation with the respective gears **10** and **13**.

The gear arrangeemnt, however, may take the form shown in Fig. 5 in which a large diameter gear segment **45** is in mesh with the gear **7** operated by the handle member. On the same plate is formed a less diameter gear segment **46** which meshes with an intermediate full circle gear **47** and which in turn meshes with the segmental gear **48**. The sash engaging arms **49** and **50** are mounted respectively on the shafts to the gears **45** and **48**. In this structure a counterbalancing spring only is used on the gear **48** which spring may be used on the arm **49** as well as on the arm **50** if desired.

The structure shown in Fig. 5 may be made either right or left hand by a change in the position of the gears **45** and **46** for the gear **48** on the arm **50** and the gear **48** placed on the shaft of the arm **49**. This structure of Fig. 5 is shown in end view in Fig. 6 and it will be noted that there are two brackets **51** and **52** provided on the plate **3a** which extend across the meeting edges of the gears **47**, **48** and **46**, **47** and tend to hold these gears which are formed of sheet metal in the same plane. This differs somewhat from the showing of the sash operating mechanism in Fig. 1 where the intermediate gear **11** has slots in which the headed studs **43** and **44** ride. In both the structures shown in Figs. 1, 2 and 5 the arms are on the ends of the shafts which extend through the plate **3** or **3a** to the opposite side from that shown in Figs. 1 and 5 as will be understood from Fig. 4.

It is thus evident that the invention is not limited to the character of the gear structure that may be utilized, the essential characteristic being that the gears for the two arms **9** and **14** or **49** and **50** shall turn in the same direction and in parallel relation by operation of the handle **6**, both turning from the down position to an upward position by rotation of the handle in a clockwise direction in Fig. 1 and both likewise turning in the opposite direction by the turning of the handle **6** in an anticlockwise direction.

It is believed evident from the foregoing description that the various features and objects of the invention are attained by the structures shown and described, and that the unique features of the invention reside in the provision of mechanism for raising or lowering a sash or glass in which the two arms both turn in the same direction and in a parallel relation at any point of rotation of the shafts to which the arms are attached and that in the structure shown in Figs. 1 and 2, with the spring **18** wound to exert pressure on the lower edge of the slot **21**, the rear vertical edge of the glass or sash will move in engagement with the bottom of its vertical runway until the rollers reach the angular portion **35** of the slots provided for each of the rollers in the bracket **22** and further that, by provision of the slots with the offset portion and the inclined portion heretofore described, the glass may be operated by the regulator mechanism to provide for ventilation at the forward end of the glass member, and it is also to be understood that various changes may be made in the structure and relationship of the parts without departing from the spirit and scope of the invention as set forth in the appended claims.

Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—

1. In sash operating mechanism, a bracket supporting the lower edge of the glass, a pair of arms each mounted at one end to turn on an axis, the bracket having a slot for each of the arms, a roller on the free end of the arms and riding in the slots, said slots each having an arcuate portion at similar ends thereof having the same axis as the roller and into which the rollers ride as the glass is raised vertically to closed position, means on the bracket engaged by an arm as the arms are turned to the end of the arcuate portion tending to move the glass laterally while in its vertically closed position, and a gear train for turning the arms in parallel relation to raise or lower the glass.

2. In a sash operating mechanism, a glass, a bracket supporting the lower edge of the glass, a pair of arms each mounted at one end to turn on an axis, and a roller at the opposite end of each arm, gear mechanism for turning the arms in parallel relation in raising or lowering of the glass, the bracket having a slot for the roller of each arm, the said slots having straight portions horizontally aligned and having an arcuate portion at similar ends of each of the slots, the radius of which is substantially the same as the radius of the roller in respect to the axis of the arms, said gear mechanism comprising a pair of gears of equal diametrical pitch each mounted on the axis of the respective arms, and a rotatable gear in toothed engagement on its diametrically opposite sides with the respective gears of the said pair.

3. In a sash operating mechanism for an automobile having a body provided with an opening and a recess therebelow, a glass member having a substantially vertical edge and a horizontal bottom edge and movable to close the opening or movable therebelow to open the same, a substantially vertical and uninterrupted runway extending along one side of the opening and extending into the recess, a bracket supporting

the lower horizontal edge of the glass and having a pair of horizontally spaced slots, a pair of arms each mounted at one end to turn on an axis, means on each of the arms for engaging in the respective slots, a gearing mechanism for turning the arms in parallel relation to raise or lower the glass, the said slots each having arcuate portions at similar ends thereof into which the said means on the arms moves as the glass is fully raised, said arcuate portions having a radius substantially equal to the radial distance of the said means from the arm axis, and means engaged by at least one of the arms limiting its movement in the arcuate portion of its slot whereby further turning of the arms on their axes moves the glass horizontally, a spring for the arm adjacent the vertical runway tending to cause the arm to exert a downward pressure in its slot and a spring for the other arm tending to cause the other arm to exert an upward pressure in its slot and to counter-balance the weight of the glass whereby, in its raising or lowering movement, the glass is held with its vertical edge bottomed in the runway.

4. In sash operating mechanism, a glass, a bracket at the lower edge thereof supporting the glass, the bracket having a slot for each of the arms, the slots having horizontally aligned portions and each terminating at like ends in an arcuate portion, a pair of arms each mounted to turn on an axis and having rollers engaging in the slots, the arcuate portion of the slots being of the same radius as the radius of the rollers from the arm axis, means for turning the arms in parallel relation to raise or lower the glass, the said rollers riding in the horizontal portions and raising the glass to its limit of vertical movement as the rollers pass into the arcuate portions, and means limiting the extent of movement of at least one of the rollers in the respective arcuate portion whereby on further turning of the arms on their axes the glass is moved horizontally, and means whereby in turning the arms in the opposite direction the glass is first moved horizontally in the opposite direction and thereafter moved downwardly.

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